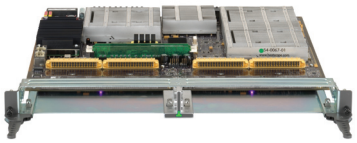
Alcatel-Lucent 7450 Ethernet Service Switch

INPUT/OUTPUT MODULE

The Alcatel-Lucent 7450 Ethernet Service Switch/Router (ESS) Input/Output Module (IOM) delivers up to 50 Gb/s (full-duplex) per-slot performance with highly scalable Carrier Ethernet service capabilities combined with the flexibility of modular, physical interface options. The 7450 ESS IOM provides high-performance IP/MPLS metro services, enabling the convergence of voice, video and data for a wide range of business, consumer and mobile network applications.



An essential element of the highly modular 7450 ESS Carrier Ethernet Switch/Router, the IOM provides configuration flexibility with high-performance, distributed forwarding and packet processing capabilities. The IOM is a full-slot module that inserts into a 7450 ESS-12, ESS-7 or ESS-6 chassis slot. Each IOM supports up to two hot-swappable Media Dependent Adapters (MDAs) or Integrated Service Adapters (ISAs). The IOM is the distributed forwarding and packet services engine, while the MDA provides the physical network interfaces and the ISA provides integrated advanced services.

The 7450 ESS IOM delivers the full complement of the Alcatel-Lucent Service Router Operating System (SR OS) capabilities targeted to the 7450 ESS, providing comprehensive support for extensive IP/MPLS Metro Ethernet services on a single module. Service providers can configure each 7450 ESS Carrier Ethernet Switch/Router with a broad range of service configurations to support Ethernet Line (E-Line) Services, Ethernet LAN (E-LAN) Services, Virtual Private Wire Services (VPWS) and Virtual Private LAN Services (VPLS) to meet the demands of metro-based services. As a result, service providers will find the 7450 ESS to be less complex to configure and maintain, resulting in increased value and lower overall total cost of ownership (TCO).

FP-based distributed processing

At the heart of the 7450 ESS IOM is the innovative and sophisticated FP packet processing complex. An Alcatel-Lucent technology innovation, FP technology delivers an optimal combination of performance and multiservice flexibility, enabling hardware-based

forwarding of IP/MPLS with granular traffic management, scalable multicast and high-touch packet services in a single packet processing complex. The FP packet processor complex delivers the multidimensional scaling required for large metro networks, allowing the 7450 ESS to deliver the speed, density and intelligent packet processing required to enable high performance IP/MPLS Ethernet services on any interface port, with performance predictability and per-subscriber granularity.

Built to address the common requirements of both multiservice edge and metro networks, FP supports all 7450 ESS interface options, so common silicon is used across platform interface modules, ensuring service consistency with complete interoperability. Purpose-built and optimized for high-demand networks, FP technology enables 7450 ESS to deliver a variety of complex consumer, business and mobile services with granular per-service and per-subscriber controls. With each IOM containing the powerful packet processing and traffic management of FP packet processing complex, the overall performance of the 7450 ESS scales linearly with the addition of each IOM to the Carrier Ethernet Switch/Router chassis.

Extensible, programmable and predictable

Highly extensible, FP technology delivers the speed, depth and predictability of a hardwired, fixed-function ASIC, with the flexibility of complete programmability and headroom to enable rapid service adaptation. This allows the 7450 ESS to easily evolve to support emerging technologies, protocols and services through simple in-service micro-code updates. This flexibility minimizes the need for premature hardware replacements, significantly reducing the TCO and greatly enhancing agility and speed-to-service capabilities.

FP2 – The path to the future of Carrier Ethernet services

The latest Alcatel-Lucent silicon innovation is the FP2 network processor, which significantly extends the power, capacity and versatility of FP technology. Implemented on the 7450 ESS Input/Output Module 3-XP (IOM3-XP), FP2 delivers up to 50 Gb/s (full duplex) in a single packet processing complex and can sustain line rate forwarding with all services enabled. FP2 provides 50 Gb/s clear channel performance, doubling 7450 ESS wire-speed Gigabit and 10 Gigabit Ethernet port densities while enabling seamless support for future higher-speed next-generation interfaces.

With FP2 technology, the IOM3-XP further scales the comprehensive range of service and traffic management capabilities, such as Hierarchical Quality of Service (H-QoS) queues, on a single packet processor complex. As a result, traffic management services and queues are shared across all ports supported by the IOM3-XP, providing enhanced flexibility in networks where subscribers or services may be heavily concentrated on a few ports, while other ports may be more lightly loaded.

Modular interface flexibility

The 7450 ESS IOM supports two MDAs per module, providing a simple and flexible approach to platform configuration. Enabling granular metro network interface flexibility, a comprehensive range of MDAs is available to enable Fast Ethernet, Gigabit Ethernet (GigE), 10 Gigabit Ethernet and Packet over SONET/SDH (PoS) in any combination on an IOM. Consequently, service providers have the increased freedom to construct Carrier Ethernet solutions with highly mixed interfaces and densities to meet a broad range of customer requirements.

Field upgradability is further simplified, as hot-swappable MDAs can be exchanged in service to change media type and physical interfaces as required. Because the IOM contains all of the processing technology, most reconfigurations only require the exchange of an MDA containing the physical interfaces, preserving a significant portion of a service providers' technology investment. This flexibility enables a high degree of investment preservation and leverage to further reduce the TCO.

Virtualized service integration

IOMs support the full family of 7450 ESS ISAs. ISAs bring added intelligent services by virtualizing advanced services into the router chassis. ISAs become fully integrated into the network and share processing capabilities, while reducing network complexity, operating expenses, rack space and power consumption. The ISA is deployed in the same manner as an MDA, and may be inserted into any IOM slot. ISAs and MDAs may be deployed simultaneously in an IOM.

Flexible 7450 ESS IOM options – IOM-1 and IOM3-XP

Two 7450 ESS IOM options are available — each version providing increasing levels of per-slot throughput and incrementally higher scale for high-touch packet services. The 7450 ESS Input/Output Module 1 (IOM-1) leverages FP technology and delivers up to 20 Gb/s (full duplex) with a full range of scalable deep-touch services. The 7450 ESS IOM3-XP leverages the FP2 network processor to deliver per-slot throughput of up to 50 Gb/s (full duplex) with an average of 8X increase in service scale over the IOM-1, while maintaining complete service and platform consistency. The IOM3-XP scales further to meet the needs of the most demanding converged environments with the headroom for years of feature expansion, bandwidth growth and service scaling.

Table 1. 7450 ESS IOM3-XP and IOM-1 compared

	7450 ESS IOM3-XP	7450 ESS IOM-1
Network processor technology	FP2 technology	FP technology
Chassis backplane throughput	Up to 50 Gb/s (full duplex)	Up to 20 Gb/s (full duplex)
Per-MDA slot throughput	Up to 25 Gb/s (full duplex)	Up to 10 Gb/s (full duplex)
Supported MDAs	MDA and MDA-XP	MDA and MDA-XP
H-QoS queues	Up to 64,000	Up to 32,000
Queue grouping	Dynamically assignable across IOM	Dynamically assignable per MDA
Queues available to all ports	Yes - all 64,000 assignable to any port on IOM	Yes – 16,000 assignable to any port per MDA
Hardware policers	1 million	16,000
Aggregate chassis capacity	1 Tb/s (half duplex)	400 Gb/s (half duplex)

Uncompromising interoperability

All 7450 ESS IOM generations can be intermixed in the same chassis, with no adverse performance or service impact. In addition, IOMs support any generation of MDA and automatically detect which MDA has been inserted to deliver the expected performance levels. As a result of FP technology design consistency, each IOM and paired MDA will operate at their intended, performance and service levels, with complete predictability. Provisioning, features and services are consistently implemented across IOMs to ensure operational continuity.

Advanced traffic management with per-subscriber, per-service granularity

Each 7450 ESS IOM provides granular and scalable traffic management services on a fully distributed basis. There are no pre-defined parameters, queue blocks or hard-coding of H-QoS capabilities in the IOM FP2 architecture. As a result, queues for granular traffic management are shared across all ports and subscribers serviced by any given IOM.

Massive queue capacity

The 7450 ESS IOM-1 provides 32,000 pooled queues, with half of the total pool available to each inserted MDA. The 7450 ESS IOM3-XP has a single FP2 packet processing complex, doubling the total number of available queues to 64,000. The IOM3-XP further extends queue flexibility by making its total queue pool available to both inserted MDAs. Consequently, each traffic management queue may be dynamically assigned, in real time, to any port, any subscriber and any service. As a result, subscribers only consume the precise number of queues needed, leaving the remaining queue resources available for assignment to other subscribers and services.

Granular queue-based traffic shaping

The 7450 ESS IOM provides granular traffic shaping at the individual queue level, overcoming the limitations and inflexibility associated with per-subscriber aggregated shaping.

Consequently, by shaping subscriber traffic on a per-service basis, the total allocated per-subscriber bandwidth can be dynamically shared across all applications or services while strict control of aggregate per-subscriber bandwidth allotments is maintained. The 7450 ESS IOM3-XP enables even deeper and more granular control over distinct flow types, allowing each queue to be shaped to four different user-definable states, with up to eight distinct priority levels. Traffic is then forwarded based on the combination of queue shaping, state and priority. The IOM3-XP also adds up to one million two-tier policers to provide even deeper levels of granular per-subscriber and per-service traffic control.

Table 2. 7450 ESS-supported MDAs with port density

MDA TYPE	PORTS PER MDA	PHYSICAL PORT INTERFACE TYPE
ETHERNET MDA-XPs		
1000Base - Fiber	20	SFP
10/100/1000Base-T (Copper)	20	RJ-45
10GBase-x (LAN/WAN PHY)	2	XFP
10GBase-x (LAN/WAN PHY)	4	XFP
ETHERNET MDAs		
10/100/1000Base-TX	20	RJ-45
100Base-FX	20	SFP
10/100Base-TX	60	5 x mini RJ-21
1000Base-x (Fiber)	10	SFP
1000Base-x (Fiber)	20	SFP
1000Base/10GBase	1/10	SFP/XFP
10GBase (LAN/WAN PHY)	1	Simplex SC
10GBase (LAN PHY)	1	XFP
10GBase (LAN PHY)	2	XFP
PoS MDAs		
OC-3c/STM-1c	16	SFP
OC-3c/STM-1c/OC-12c/STM-4c (Multirate)	8	SFP
OC-3c/STM-1c/OC-12c/STM-4c (Multirate)	16	SFP
OC-48c/STM-16c	2	SFP
OC-48c/STM-16c	4	SFP

Table 3. 7450 ESS-supported ISAs

ISA TYPE	7450 ESS IOM REQUIRED	SR OS RELEASE
Application Assurance Integrated Services Adapter (AA-ISA)	• 7450 ESS IOM-1 • 7450 ESS IOM3-XP	• IOM-1: SR OS Release 6.0 • IOM3-XP: SR OS Release 6.1

Table 4. Ordering information

PART NUMBER	PART NAME	DESCRIPTION
3HE03620AA	7450 ESS IOM3-XP	7450 ESS 50G Input/Output Module 3-XP (IOM3-XP) Baseboard – accepts up to 2 Media Dependent Adapters (MDAs)
3HE00229AB	7450 ESS IOM 1 20G	7450 ESS 20G Input/Output Module 1 (IOM-1) Baseboard – accepts up to 2 Media Dependent Adapters (MDAs)

Technical specifications

PER IOM CAPACITY	7450 ESS IOM3-XP	7450 ESS IOM-1
Slot requirements	• Single-slot module	• Single-slot module
MDA/ISA supported per IOM	• Two MDAs or ISAs	• Two MDAs or ISAs
MDA type supported	• MDA and MDA-XP	• MDA and MDA-XP
IOM full-slot throughput	• 50 Gb/s	• 20 Gb/s
MDA per-half-slot throughput	• Up to 25 Gb/s per MDA for a total of 50 Gb/s per IOM	• Up to 10 Gb/s per MDA for a total of 20 Gb/s per IOM
Indicators	• Operational: Solid green; Fault: Amber	• Not applicable
Supported chassis	• 7450 ESS-12 • 7450 ESS-7 • 7450 ESS-6	• 7450 ESS-12 • 7450 ESS-7 • 7450 ESS-6
Minimum operating system software	• SR OS Release 6.1	• SR OS Release 4.0 or higher MDA support varies by SR OS release
Dimensions and weight	• Standard IOM slot form factor • IOM3-XP weight empty: 4.99 kg (11 lb)	• Standard IOM slot form factor • IOM-1 weight empty: 4.08 kg (9 lb)
Environmental specifications	• Operating temperature: 0°C to 40°C (32°F to 104°F) • Relative humidity: 15% to 85% (non-condensing) • Operating altitude: 3048 m (10,000 ft)	
Network/element management	• Fully supported by Alcatel-Lucent 5620 Service Aware Manager (SAM) • Command line interface	• Fully supported by 5620 SAM • Command line interface
Hardware queues	• Hierarchical service queues: 64,000 – available to all IOM-attached ports • Shapers: 64,000 (1-per queue)	• Hierarchical service queues: 32,000 – assignable in 16,000 blocks to each MDA • Shapers: 32,000 (1 per queue)
Hardware policers*	• 1 million 2-tier policers	• 16,000
MAC address capacity*	• Up to 2 million 2-tier MAC FIBs	• Up to 128,000 (hardware/software)
Access Control List*	• Up to 174,000 entries per IOM • System scaling up to 1.7 million entries	• Up to 96,000 entries per IOM • System scaling up to 96,000 entries
Safety	• EN 60950-1 • IEC 60950-1 CB Scheme • CSA/UL 60950-1 NRTL • FDA CDRH 21-CFR 1040 • EN 60825-1 • EN 60825-2 • IEC 60825-1 • IEC 60825-2	
EMC	• ICES-003 Class A • FCC Part 15 Class A • EN 300 386 • EN 55022 • EN 55024 • EN 61000-4-2 • EN 61000-4-3 • EN 61000-4-4 • EN 61000-4-5 • EN 61000-4-6 • EN 61000-4-11 • IEC CISPR22 • AS/NZS CISPR 22	
Immunity	• EN 61000-3-2 Power Line Harmonics • EN 61000-3-3 Voltage Fluctuations and Flicker • EN 61000-4-2 ESD • EN 61000-4-3 Radiated Immunity • EN 61000-4-4 EFT • EN 61000-4-5 Surge • EN 61000-4-6 Low Frequency Common Immunity • EN 61000-4-11 Voltage Dips and Sags	

PER IOM CAPACITY	7450 ESS IOM3-XP	7450 ESS IOM-1
Telecom	• Telcordia GR-253-CORE Issue 3 • IEEE 802.3 (GigE, Ethernet) • ANSI T1.105 • ANSI T1.105.03 • ANSI T1.105.06 • ANSI T1.105.09 • ANSI T1.403 (DS1) • ANSI T1.404 (DS3) • ITU-T G.957 • ITU-T G.825 • ITU-T G.824 • ITU-T G.823 • ITU-T G.813 • ITU-T G.707 • ITU-T G.703	
Environmental	• ETS 300 019-1-1, Storage Tests, Class 1.2 • ETS 300 019-1-2, Transportation Tests, Class 2.3 • ETS 300 019-1-3, Operational Tests, Class 3.2 • ETS 300 019-2-4, pr A 1 Seismic	
Electronic equipment directives	• WEEE • RoHS • R&TTE • China CRoHS	
Certifications	• NEBS Level 3: ¬ Telcordia GR-1089 CORE, Issue 4, June 2006 ¬ Telcordia GR-63 CORE, Issue 3, March 2006 ¬ ATT-TP-76200 • CE	

* Hardware capacity – actual capacity depends on capacity supported in specific SR OS releases

Note: • 7450 ESS IOM3-XP expected to be available in Q3 2008
• 7450 ESS IOM3-XP requires SR OS Release 6.1, expected to be available in Q3 2008

www.alcatel-lucent.com Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein. © 2008 Alcatel-Lucent. All rights reserved. CAR2468080213 (03)

Alcatel·Lucent